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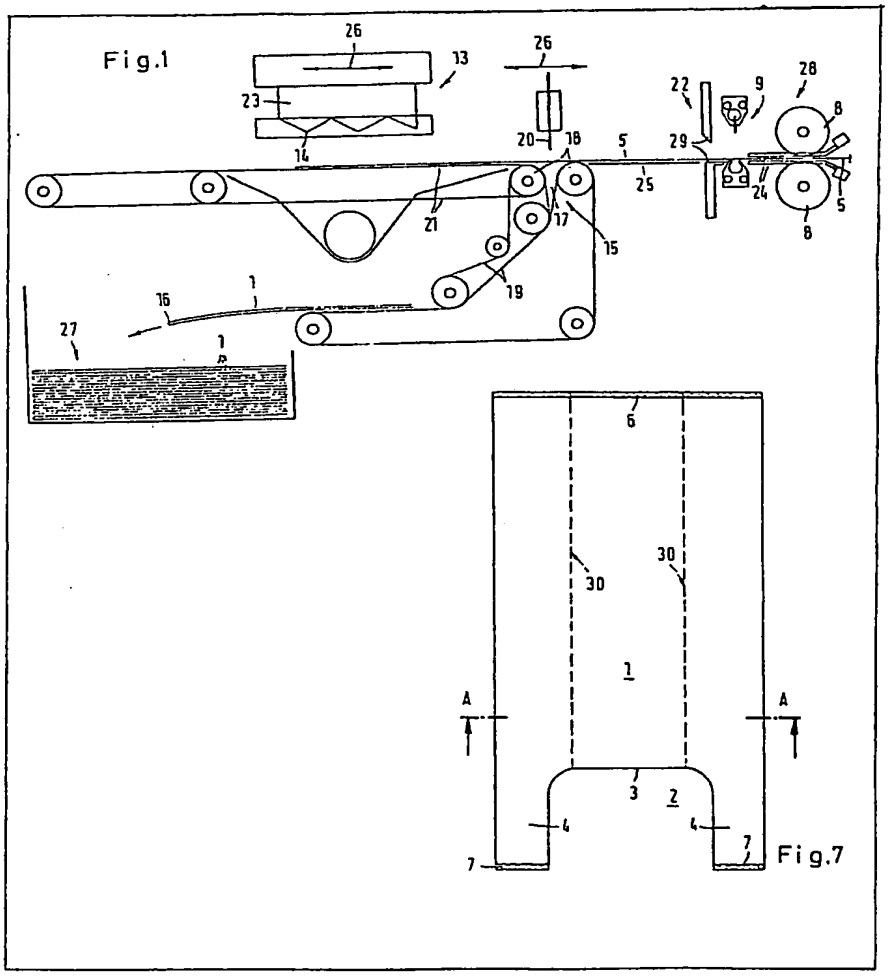
(54) **Equipment for making, folding and stacking carrier bags**

(57) Equipment for making, folding and stacking carrier bags having a mouth (2) between two carrying loops (4), comprises conveyor means for feeding successive leading end portions of a flattened plastics tubular web (5) from a transverse welding and severing station (9) to a bag-mouth and carrying loop punching station (13), a folding station (15) between the welding and punching stations (9, 13) having a folding blade (20) for transversely folding each bag, and conveyors (19), trained round guide rollers (18) spaced apart to leave a gap (17) into which the folding blade (20) pushes each bag for moving the folded bags to a stacking station (27).

A clamping attachment (22) is provided adjacent the welding and severing station (9) and remote from feed rollers (8), to clamp each bag near its base weld, the folding blade (20) being introduced into the folding gap (17) when a punching press (23) has reopened but while the clamping attachment (22) is still closed, and the clamping attachment (22) being opened when the folding blade (20) has entered the folding gap (17).



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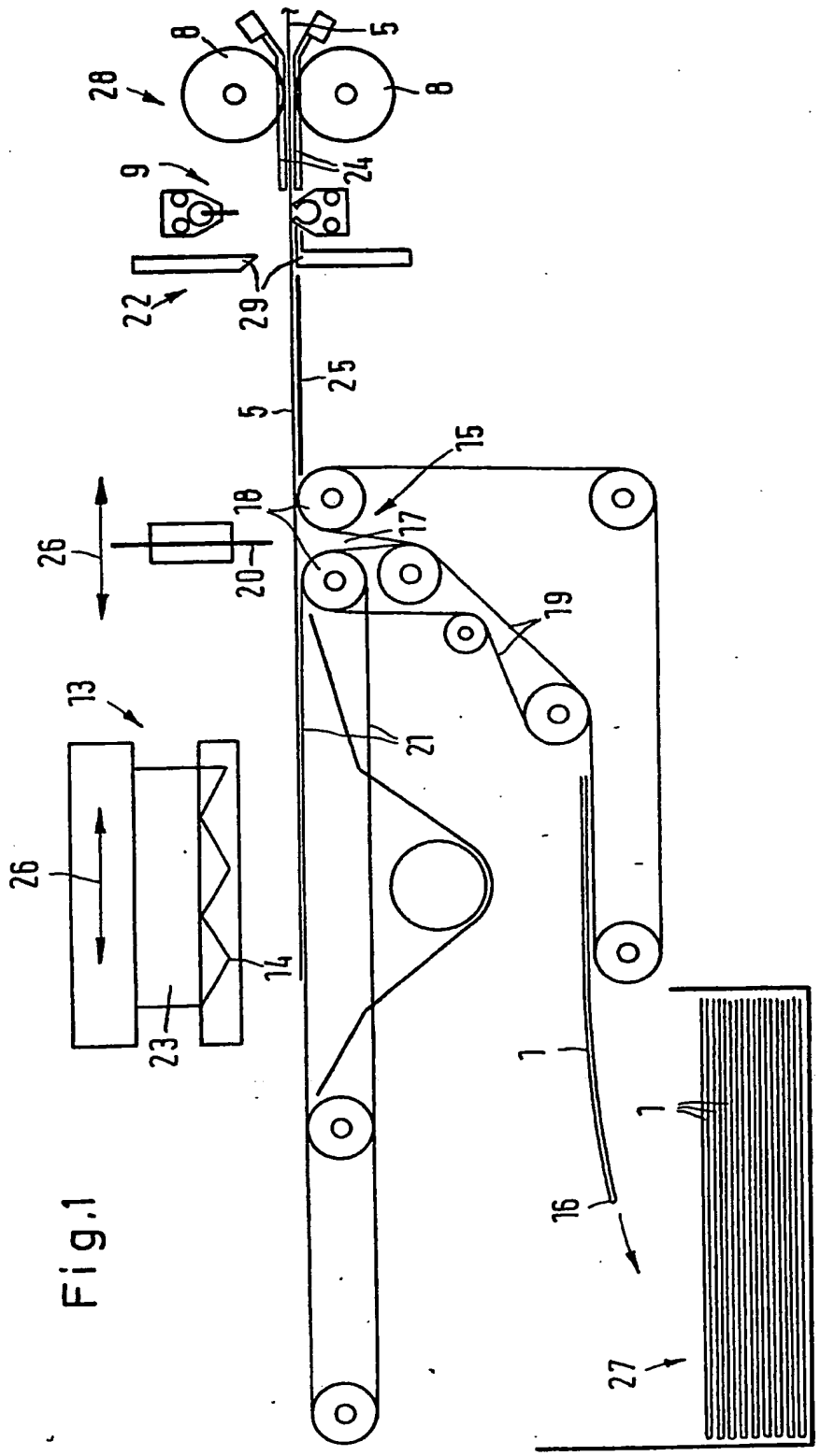


Fig.1

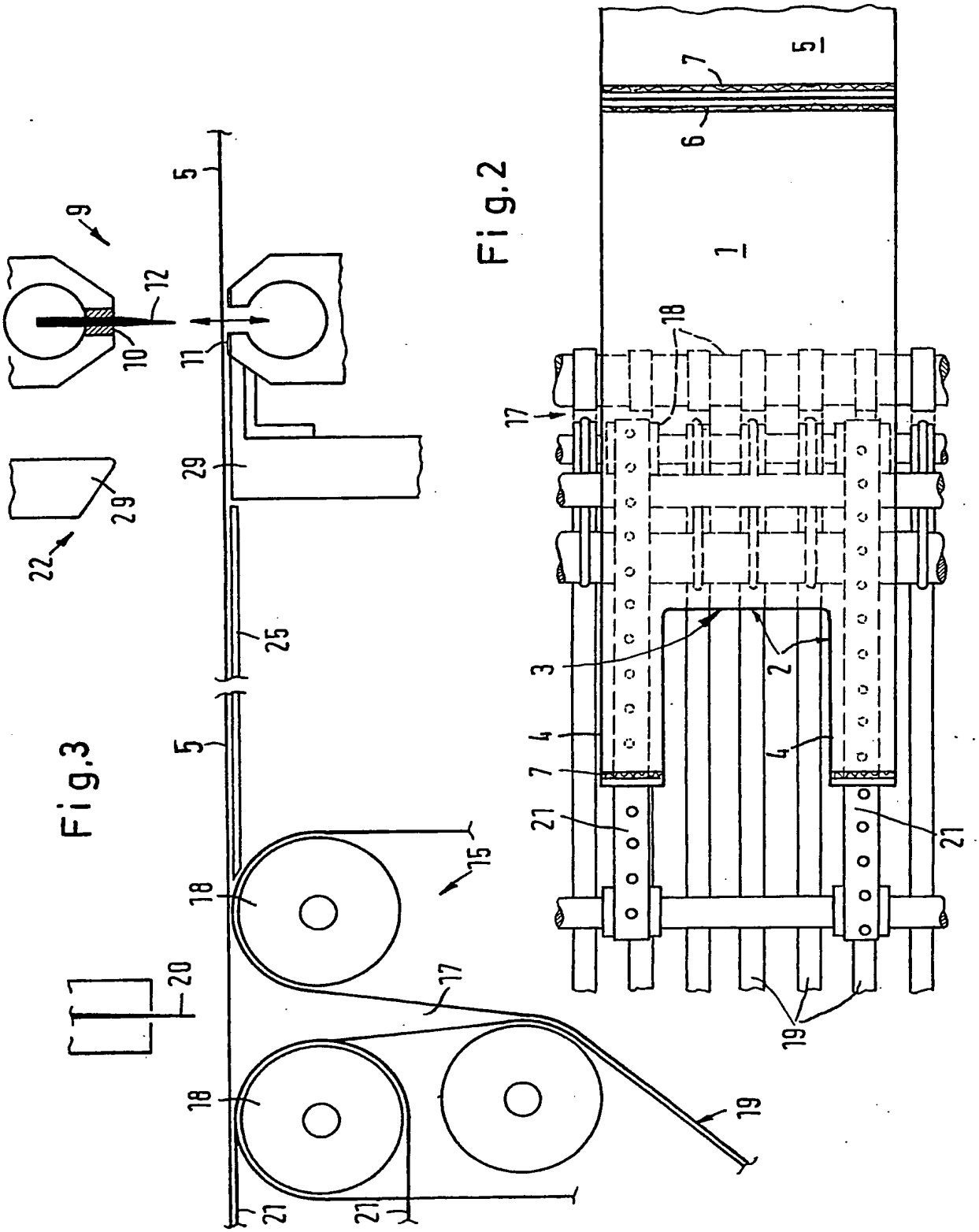

5
7
6
1
18
17
3
2
4
4
7
21
21
19

Fig.2

5
9
12
10
11
29
29
22
25
5
18
15
20
17
18
19
21
21

Fig.3

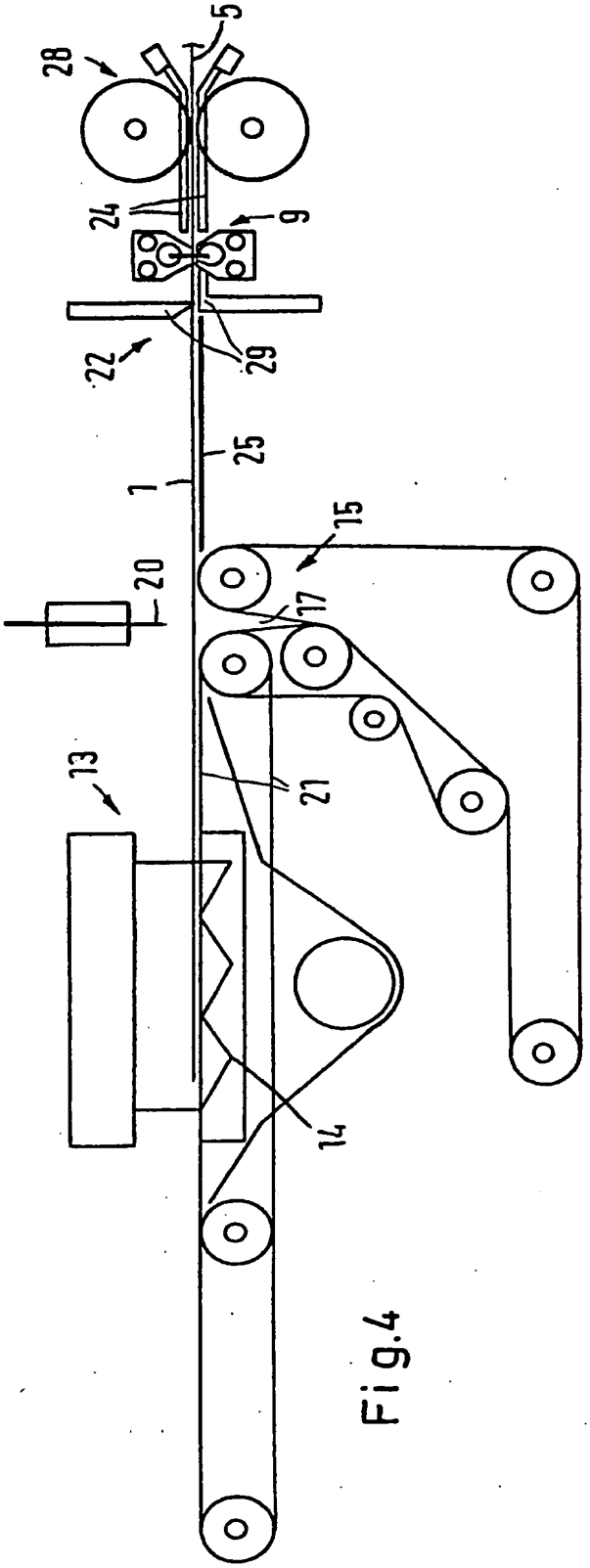


Fig.4

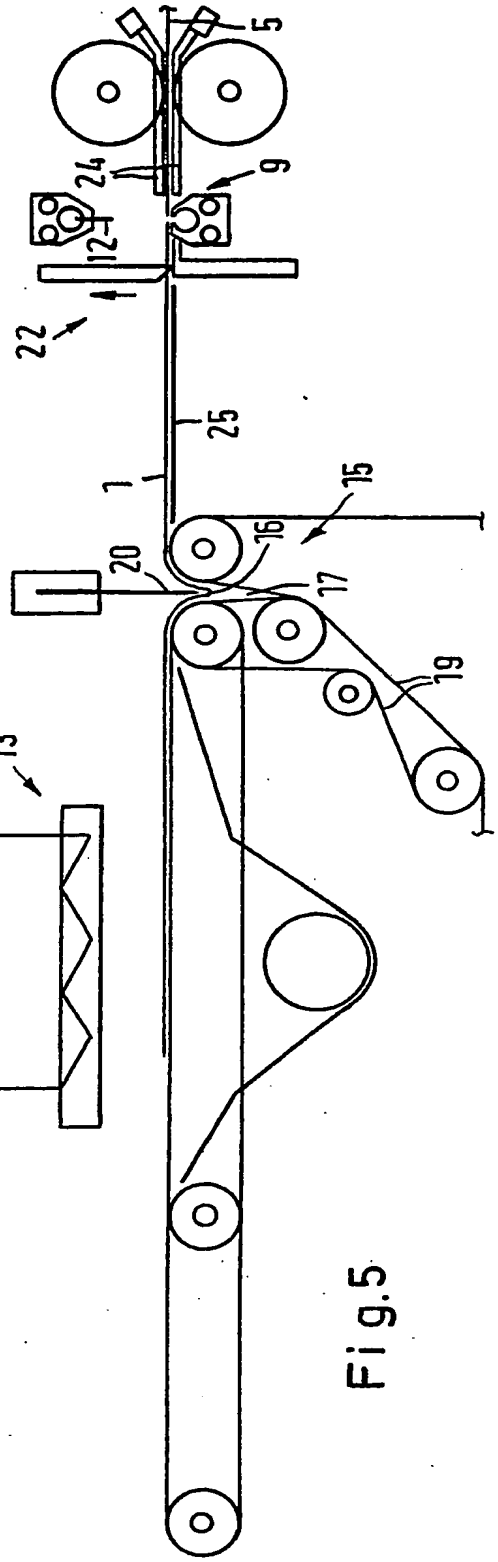
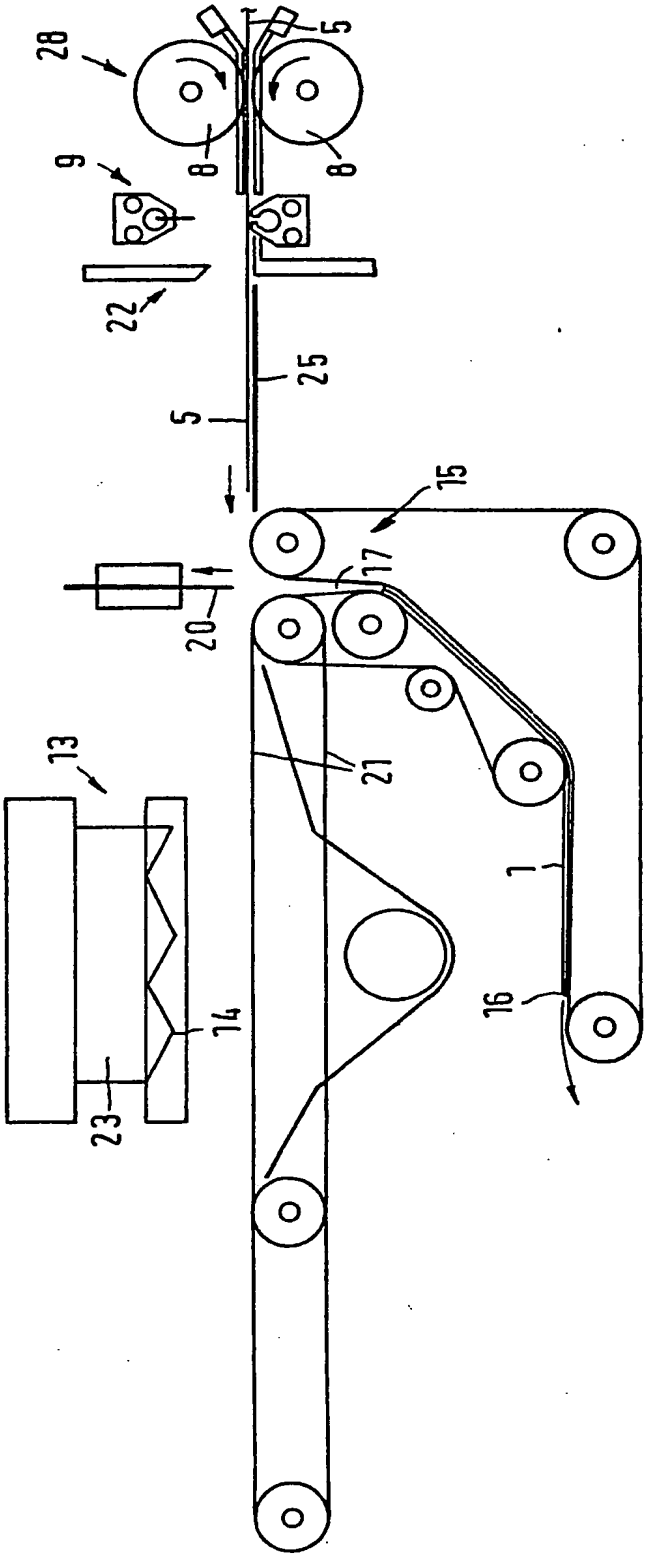


Fig.5

Fig.6



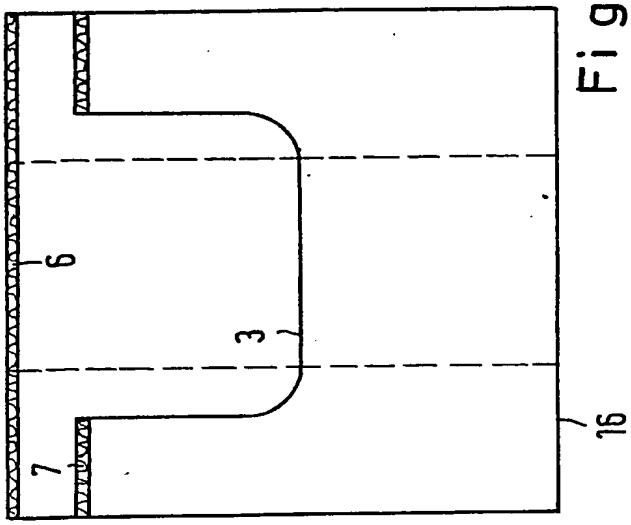


Fig.8

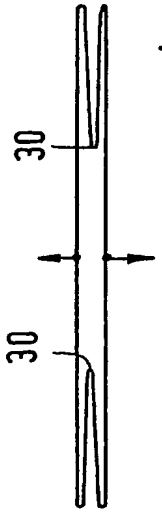


Fig.9

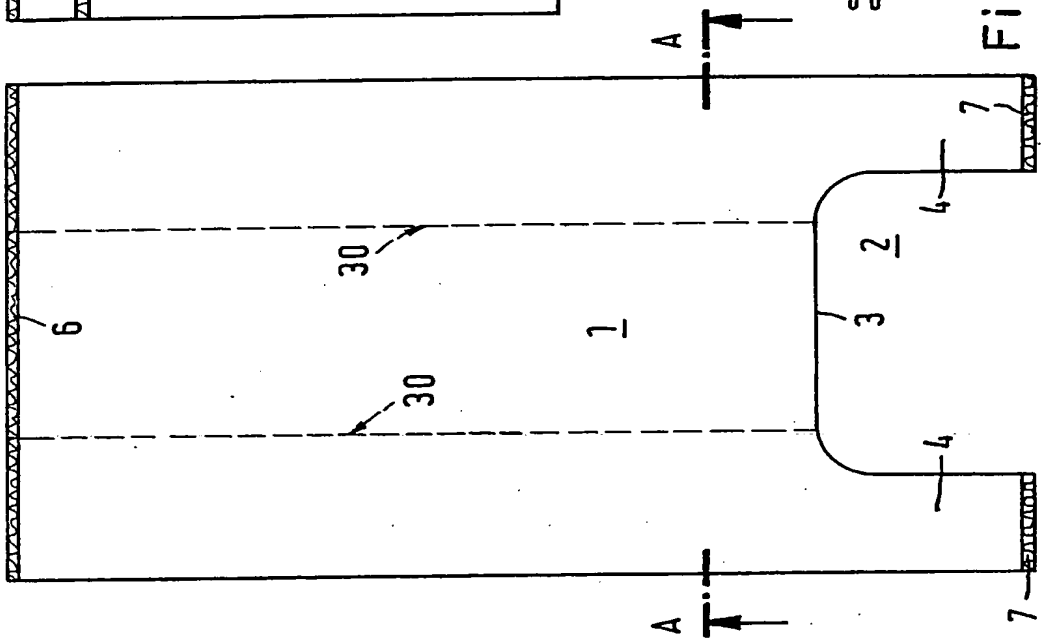


Fig.7

SPECIFICATION

Equipment for making, folding and stacking carrier bags.

This invention relates to equipment for making, folding and stacking carrier bags, having a mouth between two carrying loops, which bags are separated from a flattened plastics tube and in the flat condition form a rectangular double layer with the carrying loops projecting longitudinally, a base weld and a weld on each carrying loop, which equipment incorporates a welding station for the base weld and a punching station for punching out the mouth and the carrying loops, the stations being connected together by conveyor means. The flat plastics tube can have longitudinal wrap-overs or be devoid thereof. The carrying loops can be held in one hand when carrying goods in the bag.

In the practical prior art, lengths of tube are separated from the plastics tube by means of a welding station; they are then stacked and the stack is fed to a punching station, where the mouths and the carrying loops are punched out. At the same time, the stack is usually interfolded. When carrier bags of this type are stacked loosely and either presented in suitable containers for use as carrier bags or interfolded to form blocks, difficulties are experienced in extracting single bags, at least when using one hand (for example because the other hand already holds goods waiting to be packed). The invention arises from the realisation that carrier bags of the described construction can be manipulated much more simply if they are folded about an edge orthogonal to the longitudinal axis of the double layer, with the mouth edges pointing upwards, and disposed in this form in a stack of carrier bags. For this purpose, the stack of carrier bags is placed in a container of rectangular plan section, matching in width the breadth of the double layer forming each flat carrier bag and having a front wall with an extraction opening in the direction of extraction orthogonally thereto. The flat caarrier bags are folded about an edge orthogonal to the longitudinal axis of the double layer in the stack of carrier bags, their mouth edges pointing upwards, so that the stack of carrier bags fits in the container while the folding edges of the interfolded carrier bags are directed towards the extraction opening. The extraction opening leaves exposed the stacked mouth edges of successive interfolded carrier bags, so that the latter can be drawn one after another from the extraction opening with a downward movement.

The object of the invention is to provide equipment for making, folding and stacking carrier bags, whereby a stack of carrier bags assembled in the manner described above can be automatically produced.

According to the present invention equipment for making, folding and stacking carrier bags having a mouth between two carrying loops, which bags are severed from a flattened plastics tube and in the flat condition form a rectangular double layer with the carrying loops projecting longitudinally, a base weld and a weld on each carrying loop comprising a welding station for the base weld and a punching station for punching out the mouth and the carrying loops, connected together by conveyor means, the welding station and the punching station being adapted to forming single bags, a folding station between the welding station and the punching station and having folded tools to fold the individual bags about a line orthogonal to the longitudinal axis of the double layer, and conveyors trained round guide rollers spaced apart in the vicinity of the folding station to leave a folding gap into which a folding blade can be inserted and leading to a pair of conveyors which feed the folded carrier bags to a stacking station. The welding station is preferably adapted to act also as a severing station, to sever the individual carrier bags from the double layer.

The welding station is preferably preceded by an intermittently driven pair of feed rollers to feed the flat plastics tube and create feeding pauses, and tools at the welding station and the punching station act during the feeding pauses. Under these intermittent operating conditions, particularly rapid cycling can be reached with absolute functional reliability when the equipment of the invention is further modified by providing adjacent the welding station and remote from the feed rollers a clamping attachment which rigidly clamps each length of plastics tube in the vicinity of the base weld, and the punching station is disposed at a distance beyond the clamping attachment appropriate to the length of a bag and the said punching station is provided with a vertically reciprocating punching press with punching tools, the folding blade being introduced into the folding blade being introduced into the folding gap at the folding station when the punching press has already re-opened but while the clamping attachment is still closed, and the clamping attachment being adapted to open after the folding blade has entered the folding gap.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic side elevation of equipment in accordance with the invention;

Figure 2 is a plan of part of Figure 1;

Figure 3 is an elevation of part of Figure 1 on a larger scale;

Figure 4 corresponds to Figure 1 but at another stage in the cycle, viz., during the welding, separation and punching of a length of plastics tube;

Figure 5 corresponds to Figure 1 but at the start of the folding action; and

Figure 6 also corresponds to Figure 1 but just after the folding stroke, with fresh plastics tube being fed in;

while the remaining drawings are included to show the construction and folding of a carrier bag as made, folded and finally stacked by the equipment in accordance with the invention, and in which:

Figure 7 shows a carrier bag as made in the equipment in accordance with the invention, in the flat condition;

Figure 8 shows the carrier bag of Figure 7 in the interfolded condition; and

Figure 9 is a section, from the line A-A of Figure 7.

The equipment shown in Figures 1 to 6 is intended for making, folding and stacking carrier bags 1 having a mouth 2 and two carrying loops 4 at the edges 3 of the mouth (see also Figures 7 to 9). A carrier bag 1 of this type is formed by severing a length from a flattened plastics tube 5 and in the flat condition forms a rectangular double layer with the carrying loops 4 projecting longitudinally. It has a base weld 6 and a weld 7 on each carrying loop.

The equipment comprises an intermittently driven pair of feed rollers 8 to feed in the flat plastics tube 5 and create feeding pauses, a severing and welding station 9 having welding tools 10, 11 and a severing tool 12 to form the base weld 6 and simultaneously form the carrying loop welds 7 and sever successive lengths of plastics tube between the base weld 6 and the carrying loop welds 7, a punching station 13 having punching tools 14 to punch out the mouth 2 between the carrying loops 4, and a folding station 15 to fold the punched-out carrier bag 1 about a line 16 orthogonal to the longitudinal axis of the double layer, having rolls 18 with a folding gap 17 between them, take-off conveyor belts 19 and a folding blade 20 which can be inserted into the folding gap 17. The punching station is located along feed conveyor belts 21.

In accordance with the invention, moreover, the separating and welding station 9 additionally incorporates a clamping attachment 22, which rigidly clamps the lengths of plastics tube in the vicinity of the base welds 6. The punching station 13 is a stationary device, fixed at a distance beyond the clamping attachment 22 appropriate to the length of a carrier bag. The punching station 13 is fitted with a vertically reciprocating punching press 23 with the punching tools 14.

The folding station 15 is disposed between the clamping attachment 22 and the punching press 23. It will be seen on comparing Figures 1, 4 and 6, and later discussed in more detail, that the folding blade 20 is inserted in the folding gap 17 when the punching press 23 has already re-opened but the clamping attachment 22 is still closed, while the clamping attachment 22 should open after the folding blade 20 has entered the folding gap 17.

The welding tools 10, 11 and separating tools 12 of the separating and welding station 9 open and close in conjunction with the punching press 23 and its tools 14. However, the clamping attachment 22 is controlled independently thereof.

In addition to the feed conveyor belts 21, already referred to, from the folding station 15 to the punching station 13, conveyor belts (not shown) may be provided between the severing and welding station 9 and the clamping attachment 22 and between the clamping station and the folding station 15; however, these additional conveyor belts can be omitted, as in the preferred embodiment of the invention shown, where they are replaced by blowing conveyor nozzles 24 at the severing and welding station 9, to impel the free end of the plastics tube 5 forwards as it advances over a support plate 25 and beyond the folding gap 17 to the feed conveyor belts 21 at the punching station 13. The feed conveyor belts 21 have apertures (which can be seen in Figure 2) to which suction can be applied (by means not shown) and the belts 21 are driven at a speed substantially exceeding the maximum speed of advance of the plastics tube 5 by the blowing nozzles 24, so that slipping occurs between the advancing flat plastics tube 5 and the feed conveyor belts 21, which holds the plastics tube 5 taut, even during the folding process. To this end the feed conveyor belts 21 are driven continuously, instead of in accordance with the intermittent cycling of the feed rolls 8.

There is no difficulty in arranging to make carrier bags 1 of different lengths with the equipment shown, since the distances from the clamping attachment 22 to the punching station 13 and to the folding station 15 can be adjusted by movement of the latter stations as indicated by the double-ended arrows 26. By adjusting the position of the folding station 15 alone, it is also possible to vary the position of the fold 16 in the finished stack of carrier bags.

Figure 1 shows the equipment at the stage in its cycle when one folded carrier bag 1 has just been removed and is being delivered to a stack 27, and the plastics tube 5 is advancing through the feeder 28 towards the punching station 13. Figure 4 shows the equipment during welding and severing at one end and during punching out of the mouth 2 between carrying loops 4 at the other end. At this stage, the clamping attachment 22 is already closed but the folding blade 20 has not yet started to advance. The welding tools 10, 11 have made the base weld 6 and the carrying loop weld 7 for the next in the manner described, along two parallel transverse lines (cf. Figure 2), and the severing tool 12 is descending to make its cut.

In the functional condition illustrated in Figure 5, the welding and severing tools 10, 11 and 12 have re-opened and the punching press 23 is also open once more. However, clamping strips 29 in the clamping attachment 22 still hold the length of plastics tube firmly near the base weld 6, the carrier bag 1 is held taut by the continuously driven feed conveyor belts 21, extends beyond the folding station 15 into the punching press 23, and the folding blade 20 descends to push the punched-out carrier bag 1 into the folding gap 17, where the fold 16 is formed. When it has been formed and the take-off conveyor belts 19 have taken hold of the folded bag 1, the clamping strips 29 separate, the folding blade 20 retracts, and the flat plastics tube 5 can be fed forwards again as the folded carrier bag is led away. All these operations can take place within the normal feeding pause, even when the overall feed speed is very high, i.e., short cycle periods are used. Modern control systems readily allow the expert to realise the kinematic relationships described above.

The carrier bags 1 made, folded and finally stacked by the equipment described with reference to Figures 1 to 6 are illustrated in Figures 7 to 9. They feature a mouth 2 between two carrying loops 4 with continuous edges 3, open round the top edge so that they can be held in one hand. The carrier bags 1 are severed from a plastics tube 5 laid flat, and in the flat condition, they form a rectangular double layer with the carrying loops extending longitudinally. Lateral

wrap-overs 30 can be included as indicated in Figure 8 and as shown in Figure 9. Alernatively, simple folded edges can be provided on the longitudinal sides. Arising from their production from a long flat plastics tube 5, each bag has a base weld 6 and a single carrying loop weld 7, which is separated as it were into two shorter welds by punching out the mouth 2 between the carrying loops 4.

CLAIMS

1. Equipment for making, folding and stacking carrier bags having a mouth between two carrying loops, which bags are severed from a flattened plastics tube and in the flat condition form a rectangular double layer with the carrying loops projecting longitudinally, a base weld and a weld on each carrying loop, the equipment comprising a welding station for the base weld and a punching station for punching out the mouth and the carrying loops, connected together by conveyor means, the welding station and the punching station being adapted to forming single bags, a folding station between the welding station and the punching station and having folding tools to fold the individual bags about a line orthogonal to the longitudinal axis of the double layer, and conveyors trained round guide rollers spaced apart in the vicinity of the folding station to leave a folding gap into which a folding blade can be inserted and leading to a pair of conveyors which feed the folded carrier bags to a stacking station.

2. Equipment as in Claim 1, wherein the welding station is adapted to act also as a severing station to sever the individual carrier bags from the double layer of the plastics tube laid flat.

3. Equipment as in either of Claims 1 and 2, wherein the welding station is preceded by an intermittently driven pair of feed rollers to feed the flat plastics tube and create feeding pauses, and wherein tools at the welding station and the punching station operate during the feeding pauses.

4. Equipment as in Claim 3, wherein adjacent the welding station and remote from the feed rollers a clamping attachment which rigidly clamps each length of plastics tube in the vicinity of the base weld, and wherein the punching station is disposed at a distance beyond the clamping attachment appropriate to the length of a bag and the punching station is provided with a vertically reciprocating punching press with punching tools, the folding blade being introduced into the folding gap at the folding station when the punching press has already re-opened but while the clamping attachment is still closed, and the clamping attachment being adapted to open when the folding blade has entered the folding gap.

5. Equipment as in any one of Claims 1 to 4 wherein the punching station is located along feed conveyor belts driven continuously at a speed exceeding the feed speed of the feed rollers and having apertures to which suction can be applied.

6. Equipment as in any one of Claims 1 to 5, wherein the welding station has welding and severing tools which open and close in conjunction with the punching press and its punching tools, and wherein the clamping attachment at the welding station can be controlled independently thereof.

7. Equipment as in any one of Claims 1 to 6, wherein blowing conveyor nozzles are provided adjacent the welding station, to impel the plastics tube forwards over a support plate and beyond the folding gap to feed conveyor belts along which is located the punching station.

8. Equipment as in any one of Claims 1 to 4, wherein take-off conveyor belts are provided at the punching station for the punched-out lengths of plastics tube.

9. Equipment as in any one of Claims 1 to 8, wherein the distances from the clamping attachment to the punching station and/or the folding station can be adjusted.

10. Equipment as in any one of Claims 1 to 9, wherein the position of the folding station can be adjusted relative to the welding station and the punching station.

11. Equipment for making, folding and stacking carrier bags substantially as hereinbefore described with reference to the accompanying drawings.

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